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## Substance Use Profiles Among Gang-Involved Youth: Social Ecology Implications for Service Approaches

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### Approaches

#### **Abstract**

Substance use is a frequently cited health risk behavior in the youth gang literature, yet little is known about how substance use patterns vary among gang-involved youth or the social ecological factors that contribute to potential variation. Developing relevant and effective service approaches will require an understanding of this variation and the malleable factors that are likely to promote or inhibit particular patterns of use. Using latent class analysis, we identified four substance use classes within a school-based sample of gang-involved youth ( $n = 2,770$ ): Non-Users (38%), Past Users (15%), Casual Users (27%), and Frequent Multi-Users (21%). These classes were distinguished by substance type, frequency of use, and source of access. Demographic and substance use-specific ecological factors across the family, peer, school, and neighborhood contexts were found to significantly differentiate these classes. Specifically, acceptance of use by parents, friends, and neighbors, along with a lack of family rules and high accessibility in the neighborhood, significantly differentiated use patterns. Findings highlight the need for service approaches that are responsive to the unique needs of individuals and their environments. Implications for practice are discussed, including the potential utility of applying a harm reduction service framework to address youth gang substance use.

Key words: Adolescent substance use; Youth gang involvement; Social ecology; Service approaches; Harm reduction; Latent class analysis

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## Substance Use Profiles Among Gang-Involved Youth: Social Ecology Implications for Service Approaches

### 1. Introduction

National estimates indicate there are 1.06 million youth gang members in the United States, with approximately 401,000 youth joining gangs annually (Pyrooz & Sweeten, 2015). Many gang-involved youth experience social and economic marginalization, and like other marginalized youth, are at an increased risk of health risk behaviors and adverse outcomes (Sanders, Schneiderman, Loken, Lankenau, & Bloom, 2009; Sanders et al., 2013). A common theme across the youth gang literature is that gang membership is associated with substance use, and that gang-involved youth have higher rates of use compared to the general adolescent population. Comprehensive gang prevention programs typically include substance abuse treatment (Simon, Ritter, & Mahendra, 2013), though it is not often clear what type of treatment is provided or whether these embedded service strategies are effective. This may be due, in part, to the larger programmatic focus on violence prevention and gang desistance with health promotion as a secondary objective. Efforts to tailor or adapt service approaches to address youth gang substance use – within or outside of comprehensive initiatives – may be a promising alternative (e.g., Valdez, Cepeda, Parrish, Horowitz, & Kaplan, 2013).

As youth gang involvement continues to grow, so do the health disparities faced by this population. Substance use in particular holds significant health implications for gang-involved youth, including an increased risk of sexual risk-taking (Dickson-Gomez, Quinn, Broadus, & Pacella, 2017) and victimization (Hunt et al., 2000). Developing strategies to address the needs of these youth requires an understanding of how substance use varies and the malleable factors that are likely to promote or inhibit particular patterns of use. As very little is known about potential heterogeneity, we aim to fill this gap, generating evidence to inform the development of tailored, contextually relevant service approaches.

#### 1.1 Substance Use and Youth Gang Membership

In marginal environments characterized by poverty and limited social and economic resources and opportunities, substance use is often a coping mechanism or maladaptive behavioral response.

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Substance use may result from sustained social engagements within environments that are highly stressful (Mulia, Schmidt, Bond, Jacobs, & Korcha, 2009; Stein, Dixon, & Nyamathi, 2008), or where use is a common and normative behavior within an environment (Davis et al., 2019; Mennis, Stahler, & Mason, 2016). Many gang-involved youth are embedded within marginal environments (Quinn et al., 2019), and are subsequently at an increased risk of substance use.

Comparative studies routinely show higher lifetime and more frequent or chronic use for gang-involved youth compared to non-gang youth, specifically for alcohol and marijuana use (e.g., Swahn, Bossarte, West, & Topalli, 2010; van Dommelen-Gonzalez, Deardorff, Herd, & Minnis, 2015), with some evidence of greater tobacco, harder illicit drug (e.g., crack/cocaine, heroin, methamphetamine, ecstasy, prescription drugs, inhalants), and polydrug use (Bjerregaard, 2010; Joseph, 2008; Petering, 2016; Yoder, Whitbeck, & Hoyt, 2003). Yet, comparisons with high-risk (e.g., homeless, those who have dropped out of school) non-gang youth have found near equivalent use for certain types of substances (e.g., alcohol, marijuana: Bjerregaard, 2010; Petering, 2016; Wechsberg et al. 2015). Together, these findings suggest that gangs may serve as unique social contexts that elevate youths' risk for substance use.

Findings from several gang-only samples point to heterogeneity in use, particularly regarding the prevalence of use, the types of substances used, and accessibility of substances (e.g., Cepeda, Saint Onge, Nowotny, & Valdez, 2016; Hunt, Joe-Laidler, & Evans, 2002; Quinn, Walsh, & Dickson-Gomez, 2019). Across gang-only samples, for example, 63-98% report alcohol use, 53-98% report marijuana use, and 45-49% report cigarette use (Cepeda et al., 2016; Hoffman, Weathers, & Sanders, 2014; MacKenzie et al., 2006; Sanders, 2012). Access to these substances also varies, with family and peer networks reported as common routes of access (Hoffman et al., 2014; Quinn et al., 2019), with sources outside of these networks as another (e.g., from adults in the neighborhood: MacKenzie et al., 2006). Research with non-gang samples suggests an association between frequency of use and access source (e.g., Harrison, Fulkerson, & Park, 2000), though this relationship is underexplored for gang-involved youth.

Few studies have attempted to elucidate specific profiles or patterns of substance use among gang-involved youth. Two exceptions simultaneously point to heterogeneity in patterns of use as well as

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limitations in our current understanding of this patterning. In a sample of Mexican American male gang members, Valdez and colleagues (2005) identified two groups through patterns of correlations among lifetime and current use of seven substances: hard drug users (solely heroin or heroin/cocaine mix) and party drug users (high alcohol, moderate marijuana, some cocaine/benzodiazepine use). In a sample of predominantly male Latino and African American gang youth, Sanders (2012) discerned two different groups of users based on use frequency and substantiated via qualitative narratives around normalization: marijuana users and those who used everything else. These studies were limited by small, targeted samples and descriptive and bivariate analyses, yet point to the practical utility of, and need for, understanding patterns of substance use within the youth gang population.

Although common perceptions and assumptions about gangs and delinquency imply that all gang-involved youth are users, research does not align with this perspective. Rather, evidence points to potential variation prompting questions about *whether* and *how* patterned use occurs for gang-involved youth. As such, it is important to consider a youth's social ecology to understand the factors contributing to substance use among current gang members (Quinn et al., 2019).

### **1.2 Social Ecologies of Youth Gang Substance Use**

All youth, including those who are gang-involved, are embedded in systems of relationships that promote or inhibit healthy development, and subsequently, health risk behaviors (Bronfenbrenner & Morris, 2006; Shonkoff & Garner, 2012). The social ecological model suggests that health risk behaviors, such as substance use, are not adequately or singularly understood as behavior problems at the individual level. Rather, etiology is derivative of youths' embeddedness within their environments, particularly during sensitive developmental periods. Thus, we can expect that adolescent use will be influenced by the substance use norms and behaviors characteristic of their social contexts that, collectively, constitute a youth's risk environment (Rhodes, 2002). The social ecological and risk environment frameworks have been frequently used to study the contextual factors that influence adolescent substance use (Conn & Marks, 2017; Connell, Gilreath, Aklin, & Brex, 2010; Golden & Earp, 2012; Slemon, Jenkins, Haines-Saah, Daly, & Jiao, 2019), and together provide a useful framework for conceptualizing substance use

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ecologies that may influence variations in use among gang-involved youth.

Many gang-involved youth report substance use among family and friends, with these social networks constituting a major route of access (MacKenzie et al., 2006; Quinn et al., 2019). Gang-involved youth are more likely to use, use more frequently, and normalize their use if these behaviors are accepted by family members and/or friends (Hoffman et al., 2014; Quinn et al., 2019; Sanders, 2012). Substance use – particularly, alcohol and marijuana – has been described as a key component of gang group life and is seen as a facilitator for social interaction and group cohesion (Hunt et al., 2000). Thus, acceptance of use by family and friends, combined with limited social controls imposed on use, are likely to differentiate patterns of use.

In addition, the availability and ease of access to substances in the neighborhood (Quinn et al., 2019; Swahn et al., 2010), combined with a level of acceptance by neighbors and other adults (e.g., open use in public spaces like street corners and parks: MacKenzie et al., 2006), promotes a normative, accepting culture of use. Research on availability, acceptance, and perceived legal risks of substance use in neighborhoods where gang youth reside has primarily focused on marijuana and indicates that not all drugs are normalized (MacKenzie et al., 2006). Schools may also be important social settings given reports of greater use and selling of drugs at school by gang-involved youth (Joseph, 2008).

Cultural norms and expectations within the gang, such as normalizing marijuana and alcohol but critiquing harder drug use (MacKenzie et al., 2006; Sanders, 2012), shape levels of acceptance of use, and perceptions of use, as harmful at the individual level. Conversely, witnessing or experiencing consequences associated with use may further promote or inhibit use depending on the youth's perceived benefits. For instance, alcohol has been reported as a facilitator of physical and sexual assault (Dickson-Gomez et al., 2017), yet for many of these youth, the benefits (e.g., symbolism of belonging and identity, social lubricant, coping with stress) of using outweigh the potential consequences.

Individual demographic characteristics may also contribute to youths' ecologies and varying patterns of use. There is documented heterogeneity in the age of first use among gang-involved youth, which further varies according to substance type (Sanders, 2012). Preferences for certain substances have

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been shown to vary by race/ethnicity (Brotherton, 1996); whereas for gender, females report later age of onset (Wechsberg et al., 2015), less frequent use (Quinn et al., 2019) and experience contrasting cultural expectations around use (e.g., stricter regulations imposed by male gang members; Hunt et al., 2000; 2002) compared to males. Other household characteristics such as poverty, family structure and housing (in)stability are also associated with variations in use (Quinn et al., 2019).

### **1.3 Current Study**

Research points to variation in substance use among gang-involved youth, yet few studies have tested for distinct patterns of use characterized by substance type, frequency of use, and source of access. Similarly, attention to the social ecological factors across the family, peer, school, and neighborhood contexts have remained relatively separate from attempts to elucidate patterns of use among gang-involved youth. Accordingly, we test for heterogeneity among a sample of gang-involved youth using latent class analysis (LCA). LCA is a model-based, multivariate approach that allows for the simultaneous inclusion of substance type, frequency of use, and source of access to classify patterns of use within the sample. We then assess whether patterns differ according to substance use norms and behaviors across ecological contexts. We expect that emergent profiles, combined with attention to the substance use ecologies in which gang youth are situated, hold implications for the tailoring of service approaches.

## **2. Methods**

### **2.1 Survey Procedures and Sample Characteristics**

This cross-sectional study analyzes state-wide data collected from 8th, 10th, and 12th grade students via the 2016 Washington Healthy Youth Survey (HYS: Healthy Youth Survey, 2016). HYS uses a clustered sampling design to randomly select schools and invites all students in participating schools to complete the survey. The HYS is interleaved into two forms (A and B) and questions derive primarily from established national surveys which have been field-tested to ensure reliability and validity. Prior to participation, parents were informed that they could elect to not have their children participate, and students were notified that their survey responses would be anonymous. School participation rates were high across grade levels ranging from 81-90%. The use of HYS data for this analysis was considered

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exempt from human subjects review.

Data for the current analysis come from the Form A sample ( $n = 164,072$ ), as it contained the most variables of interest (i.e., substance use, social ecological factors). Given the study objective of assessing within-group heterogeneity in substance use patterns, a subsample of gang-involved youth was pulled from the larger Form A sample. The use of self-report for determining gang involvement has been widely supported in youth gang research (e.g., Boxer, Veysey, Ostermann, & Kubik, 2015; Decker, Pyrooz, Sweeten, & Moule, 2014). Thus, gang-involved youth were identified as those who responded “yes” to the question: “A gang is a group of people with a leader who act together often for violent or illegal activities. During the past 12 months, have you been a member of a gang?” This yielded an analysis sample of  $n = 3,882$ .

In line with quality control procedures recommended by HYS (HYS, 2016), we undertook several data accuracy checks prior to analysis. This included removing cases due to reported use of a fake drug (Loziderb), inconsistent responses across drug use categories (e.g., reported current use but no lifetime use), and extreme response patterns such as the highest use across all substance types. This process resulted in a final analysis sample of  $n = 2,770$  gang-involved youth. On average, the sample was 14.84 years old (range = 12-19;  $SD = 1.64$ ) and 60% male. The racial/ethnic composition was: 43% White, 24% Hispanic or Latinx/a/o, 5% Asian, 7% Black or African American, 4% American Indian or Alaskan Native, 3% Native Hawaiian or Pacific Islander, 6% bi- or multiracial, and 7% other.

### 2.2 Measures

Our analysis included responses to individual items from the HYS survey as well as constructed scales and indices. Scales were created by taking the mean across items, and when necessary, items were standardized to adjust for varying metrics prior to scale creation. Indices were created by taking the sum across two or more dichotomized variables.

**2.2.1 LCA model indicators.** Substance use profiles were established from seven items assessing lifetime prevalence and recent (past 30 days) use of four substance types (alcohol, marijuana, tobacco, and other illicit drugs), and substance use access. All items used in the LCA models were scored toward



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increased use/accessibility (sample probabilities reported in Table 2).

Lifetime history of use and past 30-day use were collapsed into single indicators for each of the following substance type categories: alcohol, tobacco, marijuana, and combined “other” illicit drugs. The other illicit drugs category included any one or more of the following: inhalants, heroin, cocaine, steroids, methamphetamines, painkillers, and prescription drugs not prescribed to the respondent. The final substance use indicators reflected the following scaling: 0 = *no history of use*, 1 = *used prior to the past 30 days*, 2 = *use of 1-5 days in the past 30 days*, and 3 = *use of 6 or more days in the past 30 days*.

Information about access to substances during the past 30 days was available for alcohol and marijuana. Responses included: bought from store, stole from store, got from friends, got at party, got from an older sibling, gave someone money to get it, took from home with and without parent’s permission, and got some other way. Responses were categorized and combined across the two substance types according to access source. Subsequently, binary indicators (0 = *no*, 1 = *yes*) were created to reflect whether substances were accessed across family, peer, or other outside sources.

**2.2.2 Substance use ecology factors.** Using social ecological and risk environments theories as an organizing framework, the following substance use-specific factors across individual, family, peer, school and neighborhood contexts were tested for class differences.

**2.2.2.1 Individual context.** Four measures including individual perceptions of substance use as harmful, general acceptance of adolescent substance use, consequences of use, and age of onset were assessed. *Perceived harm* was the mean of six items reflecting greater risk of harm as a function of alcohol, marijuana, cigarettes, or other illegal drug use (0 = *no risk* to 3 = *great risk*;  $M = 1.80$ ;  $SD = 0.72$ ). *Perceived acceptance* was the mean of four items reflecting how wrong the participant believes it is for other adolescents to use substances (0 = *very wrong* to 3 = *not wrong at all*;  $M = 1.12$ ;  $SD = 0.87$ ). Both scales had good reliability (Cronbach’s  $\alpha = 0.79$  and  $0.83$ , respectively). *Consequences* was a sum of eight binary items representing various substance use consequences experienced in the past year (range = 0-8;  $M = 0.42$ ;  $SD = 0.97$ ). These included: missing class or school, failed class or dropped out, got sick or had a hangover, experienced negative emotions, got hurt/injured, hurt/injured someone else, got in

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trouble with parents/family, and did unwanted or regrettable things. *Age of onset* was the mean self-reported age of first use for any use of alcohol, cigarettes, and marijuana ( $M = 12.30$ ;  $SD = 1.79$ ).

**2.2.2.2 Family context.** Four measures including parent acceptance of substance use, family rules, parental monitoring, and whether parents informed youth of the potential harms of using were assessed. *Parent acceptance* was the mean of four items reflecting participant perceptions of how wrong their parents feel it is for them to use alcohol, marijuana, cigarettes, or other illegal drugs (0 = *very wrong* to 3 = *not wrong at all*,  $\alpha = 0.77$ ;  $M = 0.58$ ;  $SD = 0.70$ ). *Family rules* was a single item measuring whether the family has clear rules about alcohol and drug use (0 = *NO!* to 3 = *YES!*;  $M = 1.99$ ;  $SD = 0.95$ ). *Parental monitoring* was a single item measuring whether the youth would be caught by their parents if they drank alcohol without permission (0 = *NO!* to 3 = *YES!*;  $M = 1.40$ ;  $SD = 1.03$ ). *Substance use education from parents* was assessed using two items reflecting whether parents talked to youth about why alcohol or drugs should not be used. These items were combined and transformed into a dichotomous indicator (0 = *no*, 1 = *received any talks/information*). A majority of youth (71%) indicated discussing substance use with parents at least once.

**2.2.2.3 Peer context.** Three measures including peer use, commitments to stay drug free, and perceptions of the participants use were assessed. *Peer use* was the mean of four items indicating how many of the participant's four best friends used substances (including cigarettes, alcohol, marijuana, other illegal drugs) in the past 12 months (0 = *none* to 4 = *4 friends*),  $\alpha = 0.81$  ( $M = 1.12$ ;  $SD = 1.13$ ). *Peer commitment to stay drug free* was a single item indicating how many of the participants four best friends made a commitment to stay drug free in the past 12 months (0 = *none* to 4 = *4 friends*;  $M = 1.51$ ;  $SD = 1.63$ ). *Peer perceptions of participant use* was the mean of four items reflecting participant perceptions of how wrong their friends feel it is for them to use alcohol, tobacco, marijuana or other illegal drugs (0 = *very wrong* to 3 = *not wrong at all*),  $\alpha = 0.85$  ( $M = 1.15$ ;  $SD = 0.95$ ).

**2.2.2.4 School context.** Two measures including receiving support at school and substance use education were assessed. *School support* was an original item indicating whether the participant's school

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provided a counselor, intervention specialist, or other staff member for students to discuss problems with substance use (0 = *no*, 1 = *yes*, 2 = *not sure*). Almost half (46%) of students stated having support at school, followed by 40% who were not sure, and 14% who said they did not. *Substance use education in school* was a single dichotomous item reflecting whether the youth received information in school regarding reasons to not use alcohol or drugs (0 = *no*, 1 = *received any talks/information*). The majority of youth (74%) indicated receiving information about alcohol or drug use at school.

**2.2.2.5 Neighborhood context.** Three measures including perceived availability of substances in the neighborhood, perceived acceptance of youth substance use by adults in the neighborhood, and perceived risk of being caught by the police for using were assessed. *Perceived availability* was a mean of four items reflecting ease of access to various substances (0 = *very easy* to 3 = *very hard*;  $M = 1.53$ ;  $SD = 0.94$ ). *Perceived acceptance* was assessed using three items reflecting how wrong adults in the neighborhood would think it was for kids to use alcohol, marijuana or cigarettes (0 = *not wrong at all* to 3 = *very wrong*;  $M = 1.06$ ;  $SD = 0.83$ ). These scales were scored toward ascending risk and had good reliability ( $\alpha = 0.85$  and  $0.68$ , respectively). *Perceived risk of being caught* was a mean of two items reflecting whether kids would be caught by the police if they used alcohol or marijuana (0 = *NO!* to 3 = *YES!*;  $M = 1.07$ ;  $SD = 0.79$ ). These items were strongly and positively correlated ( $r = 0.72$ ,  $p < .001$ ).

**2.2.3 Demographic and household characteristics.** Several demographic and household-related items were also examined (sample proportions reported in Table 3). *Living with two parents* was dichotomous, created from multiple items about the household composition, with “two parents” defined as either with two biological parents or one biological parent and a step-parent (0 = *no*, 1 = *yes*). *Living in own house* was dichotomous, created from multiple items about where the participant lived most frequently in the past 30 days, with “own house” defined as in a house or apartment that their family rents or owns (0 = *no*, 1 = *yes*). A dichotomous variable indicating any reports of *cutting or skipping meals* because there was not enough money for food in the past 12 months (0 = *no*, 1 = *yes*) was used as a proxy for student poverty. Additionally, youth provided demographic information on their age (in years), gender (0 = *female*, 1 = *male*), race/ethnicity, and grades (0 = *mostly F's* to 4 = *mostly A's*).

### 2.3 Analytic Approach

Latent class analysis (LCA) was used to test for the presence of classes of gang-involved youth relative to their substance use patterns. LCA is a person-centered approach that can identify subgroups (“latent classes”) within a sample that are similar with respect to theoretically important variables (Lanza, Flaherty, & Collins, 2003; Lubke & Muthén, 2005; Vermunt, 2004). LCA estimates a categorical latent variable and the probabilities of assignment for the sample to each class (Muthén, 2004), providing model-based statistics that allow judgment regarding the overall quality of assignment and model fit. Models are tested iteratively, adding one class at a time until fit statistics indicate that the best fitting model has been identified. Because LCA best practices do not recognize a single fit statistic as sufficient to determine best model fit (Nylund, Asparouhov, & Muthén, 2007), multiple fit statistics were examined. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are relative goodness of fit statistics used to identify the model that provided adequate fit with the fewest parameters; the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR), Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR), and parametric bootstrapped likelihood ratio test (PBLRT) provide significance tests for goodness of fit between neighboring models (Lo, Mendell, & Rubin, 2001; Nylund et al., 2007). The LMR tests tend to overestimate, rather than underestimate, the number of classes (Nylund et al., 2007); thus, a non-significant p-value for the LMR test is suggestive that the number of classes should no longer be increased. In addition, model selection included identifying the most parsimonious and readily interpretable model (Collins & Lanza, 2010).

Mean and proportional differences of substance use ecological factors were assessed across classes. For continuous measures, we used the automatic BCH method implemented in Mplus; for binary and categorical measures, we used the manual 3-step approach (Bakk & Vermunt, 2016; Muthén & Muthén, 2012). These methods adjust for classification error relative to the posterior probabilities of the latent classes, but unlike other methods, are less susceptible to class shifts and poor estimation due to unequal variances of the distal outcomes across the latent classes (Asparouhov & Muthén, 2020). Statistical significance of overall and between-class differences for each of the substance use ecology

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factors were determined using the Wald chi-square test.

Analyses were conducted in Mplus version 8 (Muthén & Muthén, 2012) using maximum likelihood with robust standard errors (MLR) to adjust for any potential clustering effects relative to the stratified sampling method used by HYS.

### 3. Results

LCA models were estimated for one- through seven-class solutions (Table 1). The AIC and BIC decreased consistently with each class until the fifth class where the BIC (which prefers parsimony) increased, identifying the four-class solution as the best fitting model by this metric. Similarly, the LMR tests indicated a significant improvement with each additional model until the addition of the five-class model. Based on these fit indices, interpretation, and parsimony, the four-class solution was determined to be the best fitting model. The average classification probabilities for the most likely class membership were good, ranging from .78 to .96. Entropy, which reflects classification certainty, was acceptable at .76.

\*\*\*\*\*Table 1 here\*\*\*\*\*

The four classes were distinguished from each other by the distribution of probabilities on the indicator variables (Table 2). Based on our interpretation of these distributions, the classes were labeled Non-Users, Past Users, Casual Users, and Frequent Multi-Users. Classes were named according to the most and least prevalent indicators as well as the degree of differentiation from the other classes. However, it is important to note that some indicators exhibited more differentiation than others.

The first class, Non-Users, consisted of the largest portion of the sample ( $n = 1047$ , 38%). This class was characterized by the highest probability of no use for each of the four substance type categories (ranging from .70-.95 probability of no use). Youth in this class also had a small probability of past, but not recent, alcohol (.22) and other illicit substance (.29) use. The second class, Past Users, consisted of the smallest portion of the sample ( $n = 412$ , 15%). This class was characterized by a high probability of past, but not recent use, particularly for alcohol (.86 probability of past use), tobacco (.70) and marijuana (.63). The probability of access to substances coming from outside sources was higher (.17) compared to

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the probability of access via family (.07) and peers (.10). The third class, Casual Users, consisted of 26% of the sample ( $n = 737$ ) and was marked by a moderate probability of alcohol (1-5 days = .52) and marijuana (1-5 days = .33; 6+ days = .27) use, which were majority accessed via peers (.55). The fourth class, Frequent Multi-Users, consisted of 21% of the sample ( $n = 574$ ) and was distinguishable by a high likelihood of regular and frequent use across all four substance types. Specifically, youth in this class were likely to have more frequent use (defined as 6+ days) compared to the other classes for alcohol (.34), marijuana (.62), tobacco (.35), and other illicit substances (.18). This class also had a higher probability of regular use (defined as 1-5 days) for tobacco (.29) and other illicit substances (.36) compared to the other classes. Youth in the Frequent Multi-Users class were largely likely to access substances via outside sources (.71) and peers (.61).

\*\*\*\*\*Table 2 here\*\*\*\*\*

### 3.1 Differences by Demographic and Household Characteristics

After identifying the latent class structure, we examined whether the classes were further distinguished by demographic and household characteristics. Between-class and overall Wald chi-square tests, adjusting for classification error, identified significant differences among the four classes (Table 3). Findings reveal a pattern of significant overall differences across all characteristics, except gender. Non-Users and Frequent Multi-Users commonly differed from the other two classes. Non-Users were more likely to be White, younger, to live in their own home, to not skip meals, and get better grades than all other classes; Frequent Multi-Users were older, got worse grades, were less likely to live in their own home with two parents, and were more likely to skip meals than all other classes. Importantly, for nearly all characteristics, Past Users and Casual Users had similar levels, significantly differing from each other on only one: fewer Past Users lived with two parents (0.83) than Casual Users (0.95).

\*\*\*\*\*Table 3 here\*\*\*\*\*

### 3.2 Differences by Substance Use Ecological Factors

We subsequently examined how substance use-specific ecological factors differentiated among the latent classes. Table 4 displays the standardized mean and proportion estimates for each class, overall

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chi-square tests, and identification of significant between-class differences. All substance use-related ecological factors across the individual, family, peer, school, and neighborhood domains were found to significantly differentiate by class based on results from the overall chi-square tests.

\*\*\*\*\*Table 4 here\*\*\*\*\*

The Non-Users class had the lowest ecological risk and the highest resources compared to the other classes. Non-Users reported greater perceived harm of substance use, a stronger commitment to avoiding drugs, while also reporting a higher proportion of resources from their family (i.e., clear rules, likelihood of being caught) and peers (i.e., reported more friends who were committed to staying drug free) than the other classes. The Past Users class fell in the midrange of most distributions, having elevated ecological risk compared to Non-Users, but lower risk than the Casual and Frequent Multi-user classes. Casual Users were consistently higher in ecological risk than Non-users and Past users. Casual and Frequent Multi-Users maintained a very similar pattern of risk across the family, peer, and neighborhood contexts except that Frequent Multi-Users were at an elevated risk level within the pattern structure. Ecological risk was consistently highest, and resources consistently lowest, for the Frequent Multi-Users. These youth reported higher personal, parental, peer, and neighbor acceptance of substance use, higher perceived ease of access of substances in their neighborhood, a greater number of consequences associated with use, and had, on average, more friends who used.

There were few exceptions to the identified patterns of ecological risk and resources that differentiated the classes. These included: age of onset, school support, and both family and school substance use education, all of which demonstrated less consistent findings between classes (i.e., fewer significant between-class differences).

### **4. Discussion**

Research points to potential variation in substance use patterns among gang-involved youth (e.g., Sanders, 2012; Valdez et al., 2005; Quinn et al., 2019), yet few studies have specifically tested for heterogeneity, particularly for patterns outside of marijuana, accounting for access source, and in large, diverse samples. This analysis is among the first to test for a more complex substance use pattern and

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subsequent differences in substance use ecologies among a large sample of youth reporting gang involvement. A latent class analysis (LCA) identified four distinct profiles: Non-Users (38%), Past Users (15%), Casual Users (27%), and Frequent Multi-Users (21%). Importantly, ecological factors germane to substance use across the family, peer, school, and neighborhood contexts significantly differentiated these classes. Findings highlight the value of a sharper focus on social ecologies to guide service approaches that fit patterned needs of gang-involved youth.

### **4.1 Tailoring Service Approaches to Fit Gang-Involved Youths' Social Contexts**

The social ecological and risk environments frameworks suggest that variations in youths' substance use will be congruent with the substance use norms and behaviors characteristic of their social environments (e.g., Rhodes, 2002). We found that gang-involved youth with increasingly serious patterns of use were embedded within social ecologies characterized by increasingly risky substance use norms and behaviors. Service approaches will be most effective when a youth's social context is incorporated (Bonomo & Bowes, 2001; Jenkins, Slemon, & Haines-Saah, 2017; NIDA, 2014; Slemon et al., 2019), and our findings suggest this is true for gang-involved youth as well.

**4.1.1 Non-using gang-involved youth.** The largest group of youth were non-users. Studies of substance use patterns among adolescents in the general population find a similar group of youth characterized by little-to-no use (Bohnert et al., 2014; Connell et al., 2010; Conway et al., 2013; Gilreath et al., 2014; Su, Supple, & Kuo, 2018), and gang-only investigations suggest that only certain substances are normalized in the youth gang culture and not all gang youth are users (e.g., Sanders, 2012). The existence of this group challenges assumptions that all gang-involved youth are users representing a distinct group of adolescents with few similarities to the broader youth population.

The non-using youth held fewer positive perceptions of substance use compared to other youth and were embedded within social contexts with little-to-no substance use risk alongside the highest ecological supports in the family and peer contexts. The emergence of the non-users group points to the need for less assumptive models for service identification and provision. Not all gang-involved youth are in need of substance abuse treatment, nor do they require the same level or type of services as those for



whom treatment is warranted.

**4.1.2 Youth with a history of experimenting.** A subset of youth, the smallest group, were characterized by a high probability of past (but not recent) use of alcohol, marijuana, and tobacco. There was no distinguishing point of access, and when substances were historically used, access was low across sources. Experimentation with common and readily available substances, as with this group, is a normative feature of adolescence, and evidence suggests that experimentation does not necessarily imply ongoing or sustained use (Khurana et al., 2015).

The past users were situated within social contexts with low ecological risk and lower family supports in addition to reporting some consequences associated with their use histories. Among adolescents in general, past, restricted use profiles are likely to remain relatively stable, but when transition does occur, evidence suggests that more mild use profiles like the Past Users are likely to move in the direction of increasingly serious use (Choi, Lu, Schulte, & Temple, 2018). Although these youth do not currently have an indicated need for intensive services, their resources and supports may be insufficient in the face of exposure to increasingly risky substance use contexts. Thus, proactively facilitating resources that are developmentally congruent may help support continued infrequent use, and perhaps interrupt the likelihood of transitioning to a more serious use pattern later on.

**4.1.3 Youth who casually use common substances.** Just over a quarter of the sample were casual users who had a relatively modest range of use of common substances. This group accessed substances mostly from peers, with a lower but equal probability of access via family and other sources. These youth may be social or party users, given that the highest probabilities of alcohol and marijuana use fell in the 1-5 days/month range (which could theoretically represent weekends). These youths' predominant use of marijuana and alcohol is consistent with use patterns normalized in the youth gang culture, and general adolescent samples (Tomczyk, Isensee, & Hanewinkel, 2016; Wu, Yan, Marsiglia, & Perron, 2020). This suggests a pattern that may reflect the increasingly normalized moderate use of common substances in the broader adolescent culture.

Those who used more casually were situated within social contexts with elevated ecological risks

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across the family, peer, and neighborhood contexts. While their risks remain lower than those with frequent, polysubstance use (Frequent Multi-Users), these youth are operating in environments where the balance of supports and resources with substance use risk may be more fragile than experimenters. Youth who use casually may benefit from efforts to shift substance use norms across contexts while encourage youth to maintain a more casual relationship to substances (as opposed to heavier use). This, combined with culturally-responsive targeted efforts to reduce use, may be most impactful at the peer or social network level (e.g., gang network) given the importance of peers during adolescence more broadly, and the fact that access is occurring primarily through these networks for more active gang-involved users.

**4.1.4 Youth who frequently use multiple substances.** Youth with frequent use of multiple substances were characterized by high probabilities of current and more frequent use across all substance types with near zero probabilities of no alcohol, marijuana and tobacco use. Substances were accessed largely via other sources (store, gave someone money, or other) and peers, with an equivalent probability of access from family as the casual users. Research has documented a similar polysubstance use group in the broader adolescent population, with lower end estimates of such use ranging from 2% to 11% (Bohnert et al., 2014; Connell et al., 2010; Conway et al., 2013; Gilreath et al., 2014; Su et al., 2018; Wu et al., 2020) to higher estimates of 20% (Choi et al., 2018). The group of frequent polysubstance users that emerged here consisted of a slightly higher proportion of the analysis sample (21%) compared to prior studies, suggesting the risk of frequent polysubstance use may be slightly elevated for gang-involved youth.

Polysubstance use of common substances (marijuana, alcohol) which also co-occurs with other illicit (or harder) drugs may relate to more negative consequences for youth (Conway et al., 2013). As such, addressing needs of youth who frequently use multiple substances will be imperative for promoting long-term health. This underscores the importance of, and need for, approaches that align with an indicated need for more intensive services for a small subset of gang-involved youth. Similar to the casual users, efforts should aim to interrupt the harms associated with use to reduce the likelihood of sustained problematic use over time. Service approaches are likely to be most effective if they are culturally- and

developmentally relevant and are tailored to the social contexts in which use is occurring. For youth who are heavy or frequent users, a harm reduction approach may be particularly effective.

### **4.2 Harm Reduction as a Service Framework for Youth Gang Substance Use**

Research on youth perspectives of substance use suggests that prevention of all use may not be an effective message (Slemon et al., 2019). This may hold particular relevance for gang-involved youth given the degree of normalization of use within the youth gang culture. Harm reduction is one approach with demonstrated success in reducing adolescent substance use and related consequences (McKay, Sumnall, McBride, & Harvey, 2014; Moffat, Haines-Saah, & Johnson, 2017) and may be a useful service framework for youth gang substance use. Harm reduction is built on the philosophy of meeting youth where they are at – across the spectrum of use ranging from safer use to managed use to abstinence – and offers compassionate, pragmatic strategies to minimize harm (Marlatt & Witkiewitz, 2010). Service strategies that are consistent with a harm reduction approach include needs assessment and individualized case planning, motivational interviewing, behavioral and cognitive-behavioral approaches (e.g., safe use practices, contingency management, skills training), and youth-centered educational campaigns which promote non-judgmental messaging across contexts and the spectrum of use (e.g., Hawk et al., 2017; Marlatt, Larimer, & Witkiewitz, 2012).

Efforts to shift individual perceptions, such as through motivational interviewing (MI) and goal setting (Bagot & Kaminer, 2018; Masterman & Kelly, 2003), may help gang-involved youth recognize and understand the potential social and health consequences of their use, thereby resulting in meaningful behavior change. Practitioners should assess needs and develop individualized case plans that include youth-directed, short-term realistic goals to reinforce a positive practitioner-client relationship and avoid a cycle of blame and disempowerment for youth (Hawk et al., 2017). Youth who hold more positive perceptions of use may benefit from cognitive-behavioral interventions which address ambivalence or resistance to change within the context of personally identified goals (Bagot et al., 2018). For those who are frequent or heavy users, discussing safe use practices and implementing a contingency management approach may also reduce potential harms and consequences of such use (Marlatt, Larimer, & Witkiewitz,

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2012). For infrequent or non-users, efforts to promote future-oriented thinking and goal setting may have preventive effects (Jenkins et al., 2017). Together, these approaches are likely to support the development and maintenance of healthy personal limits across the spectrum of use, resulting in minimal or less harmful use over time.

Harm reduction also provides developmentally congruent strategies (Leslie et al., 2008) across social contexts (CAMH, 2002; Jenkins et al., 2017; Slemon et al., 2019). We found that parental norms and expectations around use significantly differentiated substance use patterns, suggesting parents play an important role in shaping youth use. Integrating parenting practices and perspectives that are grounded in principles of harm reduction with evidence-based family programs tailored to the gang context (e.g., Adapted Brief Strategic Family Therapy (BSFT): Valdez et al., 2013), may offer a useful next step. The adapted BSFT program was designed to reduced substance use and gang identification among Mexican American youth, while increasing youth skills, parent knowledge, and family functioning. To date, the program has demonstrated positive effects for reducing alcohol use within this population (Valdez et al., 2013). Parental messaging to support youth in using within limits while building capacity to resist influence and minimize harm could be incorporated into further adaptations of programs like BSFT, thereby shifting the treatment emphasis from abstinence and gang diversion to harm reduction and health promotion.

We also found a pattern whereby increased acceptance of use by peers and neighbors, and perceived accessibility of substances in the neighborhood, associated with increasingly serious use patterns. Grounding efforts to shift peer and neighborhood norms within a harm reduction framework may be most effective for reducing use or the harms of use, particularly when messaging is non-judgmental and implemented by community members who the youth know and respect (e.g., Pollack, Frattaroli, Whitehill, & Strother, 2011). Street outreach workers, for example, often have similar backgrounds and lived experiences (e.g., gang membership, substance use) as the communities they serve, allowing them access to, and acceptance from, otherwise hard-to-reach populations such as gang-involved youth. Street outreach has demonstrated effectiveness for promoting public health campaigns to reduce

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sexual health risk and prevent violence (Wendell, Cohen, Lesage, & Farley, 2003; Whitehill, Webster, Frattaroli, & Parker, 2014), and may particularly useful for addressing youth gang substance use (Varano & Wolff, 2012). Such an approach could be instrumental in connecting youth with a variety of indicated services and supports while shifting broader social network norms and behaviors (Jenkins et al., 2017; Pollack et al., 2011).

Receiving information about the harms of substance use via traditional routes (school, parents) and having access to school supports did not consistently differentiate the classes. Research suggests that traditional education models (i.e., abstinence and prevention focused) may not resonate with youth in social contexts where substance use is positively perceived and reinforced (Jenkins et al., 2017), as is the case for many gang-involved youth (Sanders, 2012). Substance use-oriented education for gang-involved youth may benefit from a harm reduction approach given the normalization of use within their cultural milieu. Content and mode of delivery should hold specific relevancy to these youths' lived experiences and attitudinal and behavioral norms around use. School-based harm reduction programs that bring youth voice and ownership into the delivery model are promising for increasing youth engagement and adoption of content while reducing reported substance-use harms (Paterson & Panessa, 2008; McKay et al., 2014; Moffat et al., 2017).

### **4.3 Limitations and Future Research**

While there are strengths to using a large school-based sample, some characteristics of the sample may reduce generalizability. For example, demographics are likely to differ in varying degrees from those of other states. Additionally, because our sample is school-based, we are likely not capturing a subset of gang-involved youth who have dropped out or who have been expelled (Pyrooz, 2014). Tapping school-engaged youth is advantageous in that students are relatively accessible and school and family-serving systems can be more readily modified and bridged, and studies using school-based samples have greatly contributed to our knowledge regarding youth gang substance use broadly (e.g., Merrin et al., 2015). Still, research should explore substance use patterns among youth not currently in school, including whether services will need to attend to alternative contexts (e.g., housing instability, systems involvement).

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The use of publicly available behavioral health surveillance data offers a practical strategy for developing a broad understanding of substance use patterning that is complementary to more targeted sampling. As with any secondary data, we were limited to available substance use and ecological measures. For example, some survey questions comprising the ecological factors were specific to alcohol and marijuana use (e.g., parental monitoring), while tobacco and other illicit drugs measures were more limited. Additionally, measures of the school context had limited specificity regarding the type of education or support youth received, and measures, such as peer use, reflected respondents' perceptions of their environments and may not accurately assess levels of external risk. Nevertheless, such perceptions can be stronger correlates of respondent behavior than more objective external measures, particularly in cross-sectional studies (Bauman & Fisher, 1986). Future studies should use more robust and expanded measures when possible to contribute further nuance regarding the role of educators, parents, and social networks.

We were unable to examine factors specific to the youth gang context, such as length and participation level, family membership, or gender composition, which may clarify the role of the gang itself in influencing norms and behaviors. For instance, we found few gender differences; yet, research suggests that the culture of use within gangs is highly gendered – e.g., use is more restrictive for females, and often informed by male preferences/expectations of what constitutes acceptable behavior for women (Hunt et al., 2000, 2002). We may not be capturing this nuance with our sample, but it will be important to clarify any differences so that service approaches are responsive to gender-specific experiences.

Mental health and substance use often co-occur; thus, research should aim to assess the relative importance of key mental health indicators (e.g., PTSD, anxiety/depression) for substance use patterning in this population. Because of the contexts in which they are often embedded, gang-involved youth may be at a heightened risk of violence exposure or victimization, which in turn, may increase their risk for comorbid mental health and substance use issues (Nydegger et al., 2019). Clarifying this relationship will further support the development of effective approaches to address broad behavioral health needs.

## 5. Conclusion

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Addressing health disparities for gang-involved youth will require expanding on traditional approaches to research and practice with this population. Gang researchers are increasingly moving beyond the dichotomy of gang and non-gang in order to gain a more nuanced understanding of health risks unique to this population. Yet, few studies have examined within-group heterogeneity in health risk behaviors among gang-involved youth. Our study demonstrates that these youth are a heterogeneous group with respect to substance use behavior, pointing to the need for service approaches that are tailored to fit patterned needs while attending to the social contexts in which use is occurring. Harm reduction is one service framework worth exploring, and research will be needed to ensure harm reduction strategies are culturally relevant and effective for this population.

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# SUBSTANCE USE PROFILES AMONG GANG-INVOLVED YOUTH

Table 1.

Model fit statistics for one- through seven-class LCA solutions

Class	Log Likelihood	AIC	BIC	Entropy	VLMR	LMR	PBLRT
1	-17264.6	34553.16	34642.06	-	-	-	-
2	-15106.73	30275.45	30459.18	0.83	4309.71***	4275.99***	4309.71***
3	-14711.08	29516.17	29794.72	0.77	791.28***	785.09***	791.28***
4 <sup>a</sup>	-14571.55	29269.1	29642.45	0.76	279.07***	276.88***	279.07***
5	-14512.38	29182.76	29642.48	0.75	118.35	117.29	118.35***
6	-14467.28	29124.55	29687.58	0.74	90.20	89.50	90.20***
7	-14428.22	29078.44	29736.29	0.78	78.11	77.50	78.11***

*Notes.* AIC = Akaike information criterion; BIC = Bayesian information criterion; VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test; LMR = Lo-Mendell-Rubin adjusted likelihood ratio test; PBLRT = parametric bootstrapped likelihood ratio test.

<sup>a</sup>Indicates the chosen model based on outlined criteria.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .



# SUBSTANCE USE PROFILES AMONG GANG-INVOLVED YOUTH

Table 2.

Probabilities for model indicators by class for the final four-class solution

	Total sample	Non-users	Past users	Casual users	Frequent multi-users
Model Indicators	n = 2770	n = 1047	n = 412	n = 737	n = 574
Alcohol use					
No use	.32	.76	.03	.10	.01
Past use, not recent	.33	.22	.86	.33	.15
1-5 days	.27	.02	.10	.52	.50
6+ days	.09	.00	.01	.05	.34
Marijuana use					
No use	.47	.95	.29	.24	.04
Past use, not recent	.18	.04	.63	.16	.12
1-5 days	.14	.01	.06	.33	.22
6+ days	.21	.00	.03	.27	.62
Tobacco use					
No use	.55	.95	.24	.54	.09
Past use, not recent	.27	.05	.70	.34	.28
1-5 days	.10	.01	.03	.12	.29
6+ days	.08	.00	.04	.00	.35
Other illicit substance use					
No use	.54	.70	.48	.64	.19
Past use, not recent	.33	.29	.49	.33	.28
1-5 days	.10	.00	.02	.03	.36
6+ days	.04	.00	.01	.00	.18
Family access	.18	.01	.07	.33	.36
Peer access	.30	.02	.10	.55	.61
Other source access	.29	.03	.17	.36	.71

# SUBSTANCE USE PROFILES AMONG GANG-INVOLVED YOUTH

Table 3.

Standardized means and proportions by class for demographic indicators

	Total sample	Non- users	Past users	Casual users	Frequent multi- users		
Variable	n = 2770	n = 1047	n=412	n=737	n=574	Overall Wald's $\chi^2$	Between- class comparisons
Race/ethnicity							
White	0.43	0.48	0.37	0.41	0.44	64.731***	<i>a,b,c</i>
Black	0.07	0.06	0.06	0.05	0.09		
Latino/a/x	0.24	0.20	0.26	0.31	0.23		
Asian	0.05	0.08	0.05	0.05	0.02		
AIAN	0.04	0.04	0.05	0.03	0.06		
NHPI	0.03	0.02	0.05	0.03	0.03		
Mixed	0.06	0.06	0.07	0.06	0.06		
Other	0.07	0.08	0.09	0.06	0.07		
Male	0.60	0.61	0.62	0.55	0.64	6.18	<i>f</i>
Living in own house	0.91	0.95	0.92	0.92	0.80	74.48***	<i>a,b,c,e,f</i>
Lives with two parents	0.87	0.92	0.83	0.95	0.74	83.16***	<i>a,c,d,e,f</i>
Skipped meals	0.18	0.12	0.19	0.18	0.30	63.41***	<i>a,b,c,e,f</i>
Age	14.84	14.27	15.17	14.89	15.52	219.92***	<i>a,b,c,e,f</i>
Grades	2.65	3.05	2.47	2.57	2.19	211.39***	<i>a,b,c,e,f</i>

Notes. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . AIAN = American Indian, Alaska Native. NHPI = Native Hawaiian, Pacific Islander. Estimates are adjusted for classification error. Between class comparisons indicate significance at  $p < .05$  or better, where *a* = Class 1 vs. Class 2; *b* = Class 1 vs. Class 3; *c* = Class 1 vs. Class 4; *d* = Class 2 vs. Class 3; *e* = Class 2 vs. Class 4; *f* = Class 3 vs. Class 4.

# SUBSTANCE USE PROFILES AMONG GANG-INVOLVED YOUTH

Table 4.

Standardized means and proportions by class for substance use ecological factors

	Non- users	Past users	Casual users	Frequent multi- users		
Variable	n = 1047	n = 412	n = 737	n = 574	Overall Wald's $\chi^2$	Between-class comparisons
Individual context						
Perceived harm	0.50	0.10	-0.16	-0.72	580.40***	<i>a,b,c,d,e,f</i>
Perceived acceptance	-0.74	0.00	0.29	0.91	1463.13***	<i>a,b,c,d,e,f</i>
Consequences	-0.42	0.02	-0.03	0.74	434.27***	<i>a,b,c,e,f</i> ,
Age of onset	-0.20	-0.02	0.22	-0.14	30.87***	<i>b,d,f</i>
Family context						
Parent acceptance	-0.53	-0.16	0.15	0.84	746.95***	<i>a,b,c,d,e,f</i>
Family rules	0.42	0.03	-0.16	-0.55	352.08***	<i>a,b,c,d,e,f</i>
Parental monitoring	0.54	-0.16	-0.34	-0.41	459.58***	<i>a,b,c,d,e</i>
Substance use education: Yes <sup>†</sup>	0.76	0.71	0.72	0.62	26.07***	<i>c,e,f</i>
Substance use education: No <sup>†</sup>	0.24	0.29	0.28	0.38		
Peer context						
Peer use	-0.70	-0.10	0.21	1.00	1336.08***	<i>a,b,c,d,e,f</i>
Commitment to stay drug free	0.43	-0.05	-0.27	-0.36	258.60***	<i>a,b,c,d,e</i>
Perceptions of participant use	-0.69	0.03	0.37	0.73	1024.33***	<i>a,b,c,d,e,f</i>
School context						
School support: No <sup>†</sup>	0.10	0.15	0.13	0.19	38.46***	<i>a,b,c</i>
School support: Yes <sup>†</sup>	0.53	0.45	0.45	0.38		
School support: Not sure <sup>†</sup>	0.37	0.40	0.42	0.43		
Substance use education: Yes <sup>†</sup>	0.80	0.72	0.77	0.61	55.04***	<i>a,c,e,f</i>
Substance use education: No <sup>†</sup>	0.20	0.28	0.23	0.39		
Neighborhood context						
Perceived accessibility	-0.65	0.08	0.32	0.68	898.79***	<i>a,b,c,d,e,f</i>
Perceived acceptance	-0.48	-0.02	0.19	0.60	480.93***	<i>a,b,c,d,e,f</i>
Perceived risk of being caught	0.43	-0.04	-0.26	-0.39	297.39***	<i>a,b,c,d,e,f</i>

Notes. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . <sup>†</sup>proportion. Estimates are adjusted for classification error. Between class comparisons indicate significance at  $p < .05$  or better, where *a* = Class 1 vs. Class 2; *b* = Class 1 vs. Class 3; *c* = Class 1 vs. Class 4; *d* = Class 2 vs. Class 3; *e* = Class 2 vs. Class 4; *f* = Class 3 vs. Class 4.